

TAXONOMIC AND BIOLOGICAL OBSERVATIONS ON *LEISTOTROPHUS VERSICOLOR* (COLEOPTERA: STAPHYLINIDAE) FROM MEXICO¹

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ABSTRACT: Taxonomic information and illustrations of habitus and aedeagus are included to identify *Leistotrophus versicolor* (Gravenhorst 1806). Geographic distribution and field observations in Mexico are included, based on specimens from six collections, fieldwork, and bibliography.

KEY WORDS: *Leistotrophus versicolor*, Staphylinidae, taxonomy, biology, geographic distribution, Mexico

The biology of the rove beetle, *Leistotrophus versicolor* (Gravenhorst 1806) has been studied in Costa Rica (Alcock and Forsyth 1988, Forsyth and Alcock 1990a, b). The previous studies report sexual dimorphism, with males having longer bodies and mandibles (Fig. 1); however, some males with small body size may be engaged in "female mimicry" to reduce aggressive behavior from larger males and as a strategy to gain access to females. The large males show resource defense, repelling aggressively other males and increasing their opportunities for access to females in search of alimentary resources. The resources defended by *L. versicolor* reported in previous studies are carcasses, dung, and decaying fruits. Furthermore, proximity to these resources permits the beetle to wait for prey, particularly adult flies (Forsyth and Alcock 1990a).

Biological knowledge of *L. versicolor* is remarkable as compared to other staphylinids, but is based only on limited studies from sites in Costa Rica (Monteverde); no additional information has been reported for other sites from their widespread distribution (tropical and subtropical forest from Mexico to Argentina).

In Mexico, the study of staphylinids has received a considerable impulse with the recent work by Navarrete-Heredia et al. (2002), where *L. versicolor* is recorded for the first time for the Mexican states of Chiapas, Hidalgo, Oaxaca, Puebla, San Luis Potosí, Tabasco, and Tamaulipas (previous records were restricted to Veracruz). New records were also reported for Belize, El Salvador, and Honduras. All records given by Navarrete-Heredia et al. (2002) are at state level for Mexico, and at country level for sites outside Mexico, thus making it difficult to know more precisely the geographic distribution of the species. Furthermore, no taxonomic information is included to identify the species.

Our goal is to contribute to the biological knowledge of *L. versicolor* in Mexico, including taxonomic information, illustrations, geographical distribution, and biological observations in the field.

¹ Received on September 2, 2004. Accepted on November 9, 2004.

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METHODS

Taxonomic information is based on Navarrete-Heredia et al. (2002) and Márquez et al. (2004). Distribution records were obtained from the literature (Sharp 1884, Blackwelder 1944, Forsyth and Alcock 1990a, b, Herman 2001, Navarrete-Heredia et al. 2002, Márquez et al. 2004) and revision of the more important staphylinid collections in Mexico (codes identify collections in the text) [Colección Nacional de Insectos, Instituto de Biología, UNAM, Silvia Santiago (CNIN); Museo de Zoología, Facultad de Ciencias, UNAM, Juan J. Morrone (MZFC); Colección de Coleoptera, Universidad Autónoma del Estado de Hidalgo, Juan Márquez (CC-UAEH); Colección Entomológica del Instituto de Ecología, A. C., Leonardo Delgado (IEXA); Colección Entomológica, Centro de Estudios en Zoología, Universidad de Guadalajara, José Luis Navarrete (CZUG); Colección José Luis Navarrete-Heredia (JLN)]. Photographs were taken with a digital camera attached to a microscope.

We took several measurements of the specimens with a scale attached to the microscope; we considered only the specimens deposited in CC-UAEH and MZFC collections because the individuals are adequately pinned. Specimens in other collections are pinned with the abdomen contracted and the head in a position that makes it difficult to measure. The specimens of the remaining collections (except CC-UAEH and MZFC) were checked during brief visits that allowed little time to perform a morphometric analysis.

Biological information is based on field observation and label data of the specimens analyzed. We observed and collected *L. versicolor* in the municipality of Tepehuacán de Guerrero, near the town of Chilijapa in the state of Hidalgo (N 21° 1.191', W 98° 51.812'). The site is located in the Sierra Madre Oriental biogeographic province, which includes tropical forest at low altitude (near 1000 m) and cloud forest at high altitude (1300 m or more), with several degrees of human perturbation. Field work lasted for three days (June 21 to 23, 2004), with visits to several sites, collecting directly and with carrion, fruit, interception flight, and light traps.

TAXONOMIC NOTES

Leistotrophus versicolor (Gravenhorst 1806) (Fig. 1)

Staphylinus versicolor Gravenhorst 1806: 119.

Generic Diagnosis: anterior angles of pronotum prominent and acute; translucent postcoxal process of pronotum a narrow flange; mesosternum with complete mid-longitudinal carina; mouthparts directed more ventrally than anteriorly (Navarrete-Heredia et al. 2002).

Species Diagnosis: total body length 15-27 mm; black, with reddish brown setae at pronotum and elytra, and yellow setae at abdomen, especially at fifth and sixth visible segments; dorsal surface rugose; antennae slender, with first five segments long and remaining segments transverse; head conspicuously wide; mandibles from twice as long as head (mainly in males) to similar length as head

(mainly in females); pronotum shorter and narrower than head and elytra, with punctures at anterior angles; lateral margin of elytra carinate; legs with red and black spots; aedeagus as in figure 1c-d (Márquez et al. 2004).

Leistotrophus patriarchicus Scudder 1876 is a fossil species known from the U.S.A. No others species are known for this genus (Herman 2001).

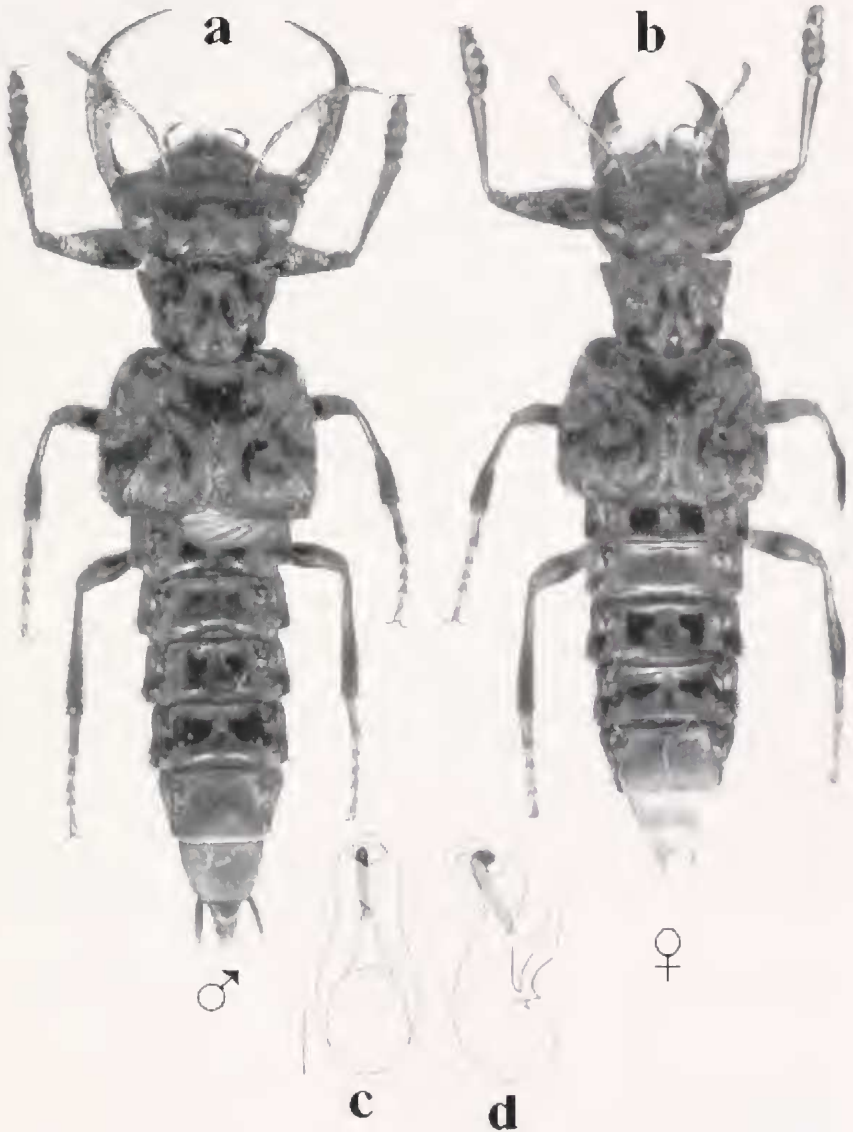


Figure 1. *Leistotrophus versicolor*; dorsal view of: a, male; b, female. Drawing of aedeagus: c, dorsal view; d, lateral view (line = 0.5 mm).

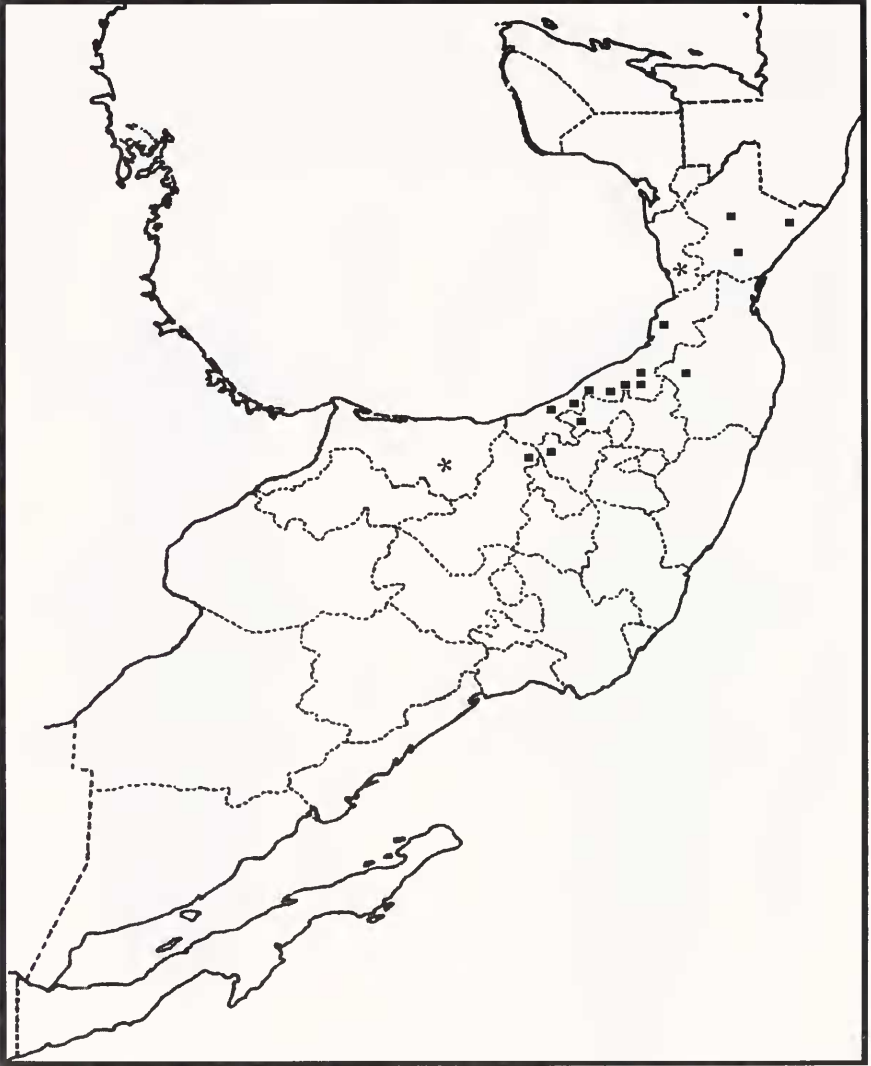


Figure 2. Geographic distribution of *Leistonophus versicolor* in Mexico. Asterisks are state records only, without dates of precise locality. Squares are localities where the species has been collected.

Geographic Distribution. *Leistotrophus versicolor* is a Neotropical species, with Tamaulipas (Mexico) as its northern limit and Argentina as its southern limit. It may be collected in tropical and subtropical areas, with predominance of rain and cloud forests. In Mexico, the species is distributed in Chiapas, the Gulf of Mexico and the Sierra Madre Oriental provinces (Fig. 2). Records from Argentina are included in Blackwelder (1944) and Navarrete-Heredia et al. (2002), but not in Herman (2001), although the latter is the most complete and current checklist of Staphylinidae of the world. Unfortunately, records from Mexico are not included in that work.

Material Examined: MEXICO (asterisks indicate state or country records). Chiapas: Berriozabal, El Suspiro (1, MZFC); Ocosingo, Montes Azules (1, IEXA); El Chorreadero, Tuxtla Gutiérrez (7, CNIN); Finca Prusia, Jaltenango (1, CNIN); Rancho Los Compadres, Ocozocoautla (1, CNIN). Hidalgo: Tepehuacán de Guerrero, Chilijapa (5, CC-UAEH). Oaxaca: San Mateo Yetla, Valle Nacional (1, CNIN). Puebla: Xicotepéc de Juárez, Hidroeléctrica "Patla" (3, MZFC); San Lorenzo (1, CNIN). San Luis Potosí: Xilitla (1, CNIN). Tabasco.* Tamaulipas.* Veracruz: Los Tuxtlas, Playa Escondida, San Andrés Tuxtla, Estación Biológica "Los Tuxtlas" (2, MZFC; 1, IEXA; 2, CNIN); Catemaco (1, CNIN); Teocelo (2, MZFC; 1 CZUG; 13, CNIN); Coatepec, Briones (1, IEXA); El Fortín de las Flores (2, CNIN); Totutla, Zacuapam (1, MZFC; 1, CC-UAEH); Sierra de Atoyac, Atoyacillo (1, IEXA); Córdoba, Guadalupe del Barrial (1, JLN), Tajín (5, CNIN); Suchi (1, CNIN); Otatitlán (1, CNIN); Tuxpan, Misantla and Xalapa (Sharp, 1884). OTHER COUNTRIES (asterisks indicate country records only): Belize.* Guatemala (Calderas, San Jerónimo, Cubilguitz, Zapote and La Tinta; Sharp, 1884), El Salvador.* Honduras.* Nicaragua (San Carlos, Estación Biológica "Bartola"; 2, MZFC; Chontales; Sharp, 1884). Costa Rica (Cache, Irazu; Sharp; 1884; Puntarenas, Monteverde; Forsyth and Alcock, 1990a), Panama (Bugaba, David, Volcán de Chiriqui, San Lorenzo and Tolé; Sharp, 1884), Colombia.* Ecuador.* Peru.* Bolivia.* Paraguay.* Venezuela.* Guyana.* Surinam.* Brazil (type locality: Brasiliae, Para; Herman, 2001; Rio de Janeiro; Sharp, 1884) and Argentina.*

BIOLOGICAL OBSERVATIONS

In Tepehuacán de Guerrero, Hidalgo, we observed several specimens of *L. versicolor* during three days. We installed three carrion traps, an interception flight trap, a decayed fruit trap, and a light trap concurrently. The traps were unsuccessful in catching any specimens, but several individuals were observed near cow dung at the periphery of the forest where human perturbation is notable. It is possible that the species is diurnal, because it was not attracted to the light and was not seen at night near cow dung; however, one specimen from Veracruz (Coatepec) and another from Chiapas (Ocosingo) were collected at night with an electric light. It would be important to study activity throughout a complete day and to observe if conduct changes over time.

Some specimens observed arrived at dung, where they stood to capture prey. Other organisms stood in the vegetation near the dung. We saw one specimen move at great speed to capture a fly. These observations agree with previous studies (Alcock and Forsyth 1988, Forsyth and Alcock 1990a).

We did not observe individuals defending cow dung, but it is probable that it occurs. Also, we did not observe specimens on other previously reported substrates, namely carrion and decayed fruit. Foraging and resource defense may vary among different geographic areas, because availability of resources is dif-

ferent. Cow dung was abundant at the study site and was the only substrate where specimens were observed. It would be important to study the conduct of foraging and resource defense with varying abundance of resources, because it is likely that the species is able to adapt its strategy opportunistically.

The specimen collected from Sierra de Atoyac, Veracruz, probably exhibited a conduct of foraging and resource defense near commercial gravy spilled accidentally on the forest floor. Its collectors observed the beetle near the gravy and unsuccessfully tried to catch it; 10-15 minutes later the beetle returned to the same site and the collectors failed on a second occasion; 10-15 minutes later the specimen returned again and was finally collected (L. Delgado pers.com.). This can be a striking example of foraging and resource defense by *L. versicolor*; and suggests a possible study that could be performed on the preferences of this beetle to forage and defend distinct resources at different sites. Another specimen from Teocelo, Veracruz was collected near a decaying banana, yet another different substrate probably defended by the insect.

Predatory strategies of *L. versicolor* are rather uncommon compared with other staphylinids, because it is a specialized obligate predator of adult dipterans, and exhibits unusual flexibility and complexity in prey capture (Forsyth and Alcock 1990b). Due to its conduct, specimens have not been observed or collected within or underneath dung, as have other staphylinids (for example some species of *Philonthus* and *Platydracus* collected in the same dung visited by specimens of *L. versicolor* in Hidalgo, Mexico). Also, it is known that *L. versicolor* emits drops of anal secretions with a dung odor attractive to prey. These droplets can be deposited on the substrate or the beetle may wave its abdomen tip with its secretion devices toward flies that happen to approach it. The ability to employ different strategies allows the beetle to forage in areas without fly-attracting rotting materials (Newton 1973, Forsyth and Alcock 1990b, Dettner and Liepert 1994, Frank and Thomas 1999).

Only two or three specimens were observed near each pile of cow dung, but we were unable to identify the sex of all the specimens, and only five were collected. It is possible that the abundance of individuals in Hidalgo is not as high as reported for Costa Rica (up to 20 individuals per pile of cow dung; Forsyth and Alcock 1990a), but our collection and observation times were very reduced and not directly focused on the study of this species. Three of the five specimens are male, and two are female. Female length is 22 and 20 mm respectively, and male length is 20, 19.5, and 15 mm, respectively.

Of the ten specimens in the MZFC collection, three from Xicotepec de Juárez, Puebla, have a total body length of 18.6, 17.4 (males) and 17.0 mm (female); four specimens from three localities in Veracruz have a total body length of 17.1 (male), 21.0, 19.3, and 15.6 mm (females); two specimens from Nicaragua have a total body length of 27.4 (male) and 18.7 mm (female); and one specimen from Chiapas has a total body length of 19.0 mm (male).

Unfortunately, we have too few specimens to generalize whether these differences are or are not consistent with the previous information indicating that

males are longer than females, but it could be interesting to study whether the male-female length proportion is the same at several localities where the species is distributed. The difference in male body length is noted in the three specimens collected and probably also the conduct of "female mimicry" at the site, but we were unable to study this question in more detail.

Mandibles of *L. versicolor* capture the prey, pinch the body with a pair of acute teeth, secrete digestive fluids and undertake a preoral digestion, as in the majority of predator staphylinids (Frank and Thomas 1999). Mandible length with respect to head length of the five specimens collected are 1.30, 1.19 and 1.04 times, respectively, for the three males, and 1.22 and 1.12 times, respectively, for the two females. Mandible length with respect to head length of the ten specimens of MZFC collection are 2.20, 1.75, 1.65, 1.56 and 1.33 for males, and 1.34, 1.25, 1.25, 1.13, and 1.13 for females. It is necessary to measure more specimens to obtain an appropriate sample with statistical significance, and to corroborate whether males have mandibles longer than females at different sites throughout their geographic distribution.

Our observations and records are limited, but lead us to wonder whether the remarkable biological characteristics of this species actually can vary at different sites under different conditions, and how this presumed variation relates to the evolution of the species. Also, we hope to contribute additional information to the poorly studied Mexican staphylinids.

ACKNOWLEDGMENTS

We thank David S. Gerandt (Centro de Investigaciones Biológicas, UAEM), Juan J. Morrone (Facultad de Ciencias, UNAM) and two anonymous reviewers for the critical revision of the manuscript. Thanks to Julio I. Islas (Centro de Investigaciones Biológicas, UAEM) for his assistance in the field. Thanks to Leonardo Delgado (Instituto de Ecología, A. C.) for the biological information given to the work. The research was supported by program PROMEP/SEP and "Programa Institucional de Investigación" (UAEM-DIP-ICBI-AAB-039).

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